

Destruction of Coral and Coral Reefs Prohibited

The taking of coral in the Gulf of Mexico and South Atlantic is prohibited, reports Jack T. Brawner, National Marine Fisheries Service's Southeast Regional Director. Federal regulations, which implement the Fishery Management Plan for Coral and Coral Reefs, now protect over 400 species of coral and apply to the fishery conservation zone which extends from the outer boundary of state waters (9 n.mi. off Texas and the west coast of Florida, and 3 n.mi. off the east coast of Florida and the other states) seaward to a distance of 200 n.mi. from the coastline.

Protected corals include fire corals, hydrocorals, sea fans, sea whips, precious corals, sea pens, and stony

corals, as well as hard bottoms, deep-water banks, patch reefs, and outer bank reefs. Taking of coral is defined to include damaging, harming, or killing of the coral.

According to Brawner, there had been substantiated reports of wholesale destruction of coral reefs before the regulations went into effect. "Destruction of our coral reefs cannot be tolerated," said Brawner, adding "Harvesting corals must be for scientific or educational purposes." Corals are live but sedentary organisms, particularly vulnerable to physical and biological destruction. Because many species are slow growing, they would not recover for many years if damaged.

The regulations also establish habitat areas of particular concern for corals that are currently or potentially

threatened. These areas include the West and East Flower Garden Banks off Texas, the Florida Middle Grounds off the west coast of Florida, and the Oculina Bank off Ft. Pierce, Fla. Fishing with longlines, fish traps or pots, and bottom trawls in these threatened areas is prohibited. Any illegal taking of coral in the fishery conservation zone should be reported to Federal law enforcement officials. Violators may face penalties up to \$25,000 for each offense. Anyone taking corals must have a permit from the National Marine Fisheries Service. Information on permits and current regulations may be obtained from the Fishery Operations Branch, National Marine Fisheries Service, 9450 Koger Boulevard, St. Petersburg, FL 33702, (813) 893-3723.

Foreign Fishery Developments

New Peruvian Plant to Produce "Marine Beef"

A Japanese engineering company has built a "marine beef" plant in Peru which will produce a dehydrated protein concentrate that reportedly can be used in a variety of meat and poultry dishes. The pilot plant, for Peru's state-owned fishing company, Pescaperu, is located at the largely unused San Andres Fisheries Complex near Pisco, about 230 km south of Lima.

Marine beef is a new type of fish protein concentrate which can easily be rehydrated for home use. Its unique feature is that it reportedly has the texture of ground meat when prepared and can thus be used in a wide variety of foods. Construction of the plant was completed in 1984, but the plant had not yet begun operating.

The process consumes large quantities of ethanol alcohol which is very expensive in Peru. About 97 percent of the alcohol is recovered, but the 3 percent consumed still increases the cost of the final product to the point that it cannot yet be successfully marketed in Peru. Pescaperu officials hoped to begin production at the plant in early 1985.

Peru has only a small livestock and poultry industry. Feed grains have to be imported, making it costly to raise both livestock and poultry in Peru. As a result, fish is the only inexpensive animal protein available to feed the country's rapidly growing population. There is a great demand, however, for meat and poultry. Pescaperu officials decided that the marine beef technology would be a way of converting

the country's abundant fishery resources to a product that can be used in various meat and poultry dishes.

Home Preparation

Marine beef is a product that the average Peruvian consumer may find convenient and easy to use. It has a faint smell of alcohol and fish, but this disappears when the product is soaked in water before cooking. The consumer can easily rehydrate marine beef by soaking it in water for about 40 minutes. After rehydration it is rinsed in water a few times and then is ready to use. Marine beef expands to about 5 times its dry weight. It is flavorless and can be used either as a meat "extender" or by itself, usually in food that has sauces to provide the flavor. Bouillon can also be used to flavor it. Pescaperu officials report that the product has been tested in Lima restaurants and that no one detected the substitution of marine beef for the meat or poultry dish ordered.

Raw Material

Marine beef can be made from

either pelagic or demersal fishes, and the end product has virtually identical characteristics, regardless of the species used. This was an important factor for Peru, because many of the alternative fishery products, such as minced fish and surimi, are currently made mostly from demersal species with a low fat content. The marine beef can be made from the more oily pelagic species found off Peru. Pescaperu planned to begin production with sardines, but other species, (i.e., jack mackerel) which exist in even larger quantities off Peru, can also be used.

Processing

The Pisco pilot plant's capacity is about 1 metric ton (t) of marine beef in 12 hours. Depending on the condition of the fish, it takes from 16 to 22 t of raw fish to produce 1 t of marine beef, giving yields of 4.5-6.2 percent. The lower yield was obtained from fish in poor condition with which Pescaperu was experimenting to determine in what condition fish can be fed into the process. This is an important factor, as Peruvian fishermen are accustomed to catching fish for reduction to fishmeal, and many vessels are not equipped to handle fish which will be used to produce edible products.

Marine beef is made by concentrating fish protein without altering the amino acid balance. The fish is run through the plant on a continuous line. The heading, skinning, deboning, and mincing steps are the same as in other fish processing procedures. The bones and offal are used to make fishmeal. The minced fish is washed with water to remove refuse and blood. The water is then removed by a screw process. Most of the process is run at low temperatures to prevent protein destruction.

The meat is next put through an alkali blanching process by adding sodium bicarbonate. Additives are mixed, the pH adjusted, and the product kneaded. Kneading the fish with salt breaks down the muscle fiber and forms a viscous paste which is mixed with the alcohol to denature

and coagulate the protein, precipitating the muscle fibers into a new fiber structure similar to meat. The product is then extruded and put through four solvent extraction steps to remove as much of the fat as possible. The product is finally dried and packaged as pellets. Dust from the pelletization process will be collected for use as high-protein additives in other foods. The alcohol extracted from the process is purified and reused. Fish fat from the washing and alcohol purification is recovered and refined to produce fish oil.

Composition

The final product is about 90 percent protein. The primary amino acids are lysine and leucine, but six other amino acids are found in significant quantities (Table 1). The product is virtually fat-free and has a moisture content of less than 8 percent.

It is claimed that the low-fat, low-calorie, but high-protein product is a healthy food. It has a protein content similar to beef and pork, but with fewer calories. Japan's National Nutrition Institute has approved the use of marine beef for human consumption. No artificial substances or harmful additives are used. The major substances added are salt and sodium bicarbonate. The ethanol alcohol, used to sterilize the product and to remove the fat, also has the added benefit of removing cholesterol, polychlorinated biphenyls (PCBs), and agricultural chemicals which may be present in the fish.

Marketing Plans

Peruvian officials plan to market

Table 1.—Marine beef technical data for final dry product, based on marine beef from Alaska pollock produced in Japan.

Item	Composition		Proteins	
	Percent		Amino acid	Percent
Protein	88.0-92.0		Lysine	9.75
Moisture	6.3-7.6		Leucine	7.35
Ash	2.0-4.4		Threonine	4.19
Fat	Negl.		Valine	4.12
			Isoleucine	3.70
			Phenylalanine	3.14
			Methionine	3.04
			Tryptophan	1.20

marine beef in several different ways. The goal is to first refine the process and reduce the price of the end product to less than half of the price for ground beef. The product could be used in the "Restaurantes Populares" subsidized by the Government for low-income consumers. Trials with spaghetti and marine beef "meat sauce" at these restaurants, for example, have been successful. Officials also plan to use marine beef for school lunches and in preparing food for the military. It will be sold in food stores, both by itself and mixed with ground beef and pork. Other products such as paste and cookies with marine beef added are also being studied.

Marine beef is also expected to be an attractive product to market in isolated Andean villages. The virtual absence of fat enables it to be shipped and stored without refrigeration. Marine beef can be stored at room temperature for up to 2 years. The new product has an added marketing advantage in that it is a dehydrated product which substantially reduces transportation costs. These advantages will make it possible for marine beef to be marketed in Peruvian towns and villages that do not normally receive seafood shipments.

Marine beef may also have export potential. It could be a convenient food for campers and hikers, given its light weight and storage characteristics. The growing popularity of outdoor activities in the United States and other countries could represent a ready market. (Source: IFR-84/65R.)

Peru Harvests and Cultures Scallops

Peru has developed an important new fishery for the scallops *Argopecten purpuratus*. While scallops have always been present off Peru, until the 1982-83 El Niño event, they were never harvested in commercial quantities. Peruvian biologists are divided as to whether the population increased as a result of El Niño or whether large populations were

always there, but not utilized. As a result, Peruvian officials do not yet know whether the return of more normal oceanographic conditions along the Peruvian coast will affect the scallop population. Most of the production is currently shipped frozen to the United States. These shipments totaled almost 930 metric tons (t) worth \$6.6 million in 1983 (Table 1). There were no shipments in 1982. Smaller quantities are shipped to Europe, mostly France. Exports to the United States began to decline in April 1984, primarily because of a closed season in the major fishing area.

Peru's scallop catch is currently taken by divers. Several fishermen, however, have obtained Government concessions from the Ministry of Fisheries to culture scallops in coastal areas. The concessions range in area from 0.5 to 10.0 hectares. One of the centers of this activity is an area near Pisco, about 230 km south of Lima. Scallop fishermen first began to stock concessions with juvenile scallops in mid-1983. The participating fishermen have just begun to harvest the seeded scallops. Data on the results of these harvests are not yet available, but preliminary reports suggest profitable returns.

Collecting Juveniles

The scallops are gathered by divers from boats 10-15 m in length. The boats generally have air compressors

Table 1.—Peruvian scallop exports to the United States, 1983-84.

Month	Exports (1,000 t)	
	1983	1984
January		245.1
February		246.8
March		248.5
April		100.2
May		76.5
June		101.6
July		16.8
August	6.9	
September	66.3	
October	179.9	
November	257.2	
December	417.9	
Total	928.1	

Closed season imposed in major fishing areas.

which pump air to the divers so they do not have to surface continuously. Most of the boats are based at Chaco or at the San Andres Fisheries Terminal. The diving is usually conducted from 8:00 a.m. to 1:00 p.m. The divers use a "capacho" net to collect the scallops. Those that are under 5 cm are used to seed new scallop beds. The seed scallops are sold for about \$4.00 for a can containing about 960 juveniles. Scallops are sold in sacks containing 8 dozen (96) scallops which are called a "manejo." The smaller seed oysters are sold in cans containing about 10 manojos. Divers report that they can collect from 6 to 30 cans of scallops per day.

Stocking Juveniles

Divers disperse the juvenile scallops in the Government concessions obtained by the fishermen. The area chosen for the concessions is shallow coastal water, 2-5 m deep. Stocking density varies, depending on the availability of juveniles and individual practices of each fishermen. As scallop culture is a new activity in Peru, data to establish optimal stocking densities have not yet been collected and analyzed. One company began to seed a 1.3 hectare concession on 26 March 1984, and has seeded a total of 173,000 juveniles. Its scientific advisor, Rene Mayo, believes that about 100 scallops/m² can be stocked (about 1 million scallops per hectare), but others say this is much too dense. The company is collecting data on salinity, dissolved oxygen, and temperature, and every week a diver checks the scallops, looking especially at mortalities. They report mortalities totaling only about 2 percent. The biggest problem appears to be predators like sea snails, octopus, and crabs. Divers periodically clear such predators from the concessions. Human poachers are another problem, and growers now arm guards who remain on rafts during the night with shotguns.

Hatchery Seed

Researchers at the Fisheries School of the Universidad Agronoma

"Molina" (UAM) in Lima have been producing juvenile scallops in a hatchery. UAM researcher Victor Venturi H. reports success in raising juveniles using "berried females." UAM does not currently plan to breed scallops as it believes an adequate supply of juveniles can be produced using the "berried females." Closing the breeding cycle is a much more difficult task, which would require more funding than is currently available. (Source: IFR-84/68.)

Chilean Fishing Harvest Reported

Chile reported a record catch surpassing 4.0 million metric tons (t) in 1983, up 8 percent over 1982. The 1982-83 "El Niño" phenomenon increased the quantity of the landings, apparently causing a shift southward into northern Chilean waters of fish normally found further north off Peru. The El Niño also affected the species composition of the catch. The two major fish species caught, however, remained the South Pacific sardine (2.8 million t) and the jack mackerel (0.8 million t). These pelagic fishes are the backbone of the fishmeal industry.

Fishmeal production and exports constituted, as before, the single most important activity of the industry. Clams made up the greatest percentage of mollusks, and crabs were the leading crustaceans. *Gracillaria* sp. was the leading seaweed. Fishmeal production utilized over 85 percent of all marine landings by quantity. The value of exports reached \$445 million, 8 percent above the 1982 level, accounting for nearly 12 percent of total Chilean export earnings.

The U.S. Embassy in Santiago has prepared a 21-page report on Chilean developments. The report includes information on resources, landings, utilization, exports, companies, employment, fleet, and aquaculture. Interested U.S. companies can purchase a copy for \$7.00 by ordering report number PB85-134450 from NTIS, Springfield, VA 22161. (Source: IFR-84/102.)